

3.3.5.6 Northern Wet Forest

3.3.5.6.1 Community Overview

Northern wet forest encompasses a group of weakly minerotrophic, conifer-dominated, acid peatlands located mostly north of the Tension Zone. The dominant trees are black spruce and tamarack. Jack pine is a significant component in parts of the type's range. This community is found primarily in kettle depressions or partially filled basins, on glacial outwash landforms, moraines, and till plains, where the water table is near the surface or where drainage is somewhat impeded. The community also occurs along the margins of lakes and low-gradient streams. On the wetter side of the moisture gradient, this community tends to grade into muskeg, open bog, or poor fen. On the drier side, the spruce-tamarack swamps may grade into "rich" swamp forests of northern white cedar or black ash, if a source of nutrient-enriched groundwater is present. In much of the type's current range the adjacent uplands are still forested, most often with second-growth stands of northern hardwoods, pine, or aspen. A minerotrophic "moat" (or "lagg") may occur at the upland-wetland interface, and can support a diverse assemblage of tall shrubs, swamp hardwoods, and "rich" swamp conifers such as northern white cedar.

Northern wet forest was widespread and relatively common historically, although due to the landforms with which it was associated, it did not typically occur in large patches in Wisconsin. Northern wet forest remains relatively common in much of its range today. WDNR's Natural Heritage Inventory Program has recently split northern wet forest into two types (described below) to better reflect community variability. Community composition and water chemistry were used as the primary factors that differentiate the types. Because the Natural Heritage Inventory Program's older inventory information did not consider those factors when classifying coniferous wetlands, northern wet forest (Curtis 1959) has been retained as a type.

Black spruce swamp represents the more acid "bog" forests. The understory is characterized by a deep, continuous carpet of sphagnum mosses (*Sphagnum* spp.). Other representative plants include ericaceous shrubs such as leatherleaf, Labrador-tea, creeping snowberry, small cranberry, and herbs that are adapted to or tolerant of saturated substrates and high acidity, such as swamp false Solomon's-seal, three-seeded bog sedge, and boreal bog sedge. A deep accumulation of sphagnum mosses partially isolates the plant assemblage from the influence of mineral-enriched groundwater, limiting composition to a relatively small group of specialists, and also limiting the growth of trees. Black spruce swamp is widespread in much of northern Wisconsin, locally common in the central part of the state, and occurs in disjunct outliers as far south as Columbia and Ozaukee counties.

Tamarack swamp is a less acid, wet conifer forest community that can support nutrient-demanding understory plants that are also tolerant of relatively high pH levels. Tamarack is the dominant tree, sometimes to the virtual exclusion of other tree species. In some stands, hardwoods such as paper birch, red maple, black ash, and American elm occur as canopy associates, saplings, or subcanopy trees. The understory may be more diverse and structurally complex than in the more acid spruce-dominated swamps, and sometimes features a well-developed tall shrub layer composed of plants with relatively high nutrient demands such as speckled alder, alder-leaved buckthorn, bog holly, and winterberry holly. Ericaceous shrubs and many sedge species are usually present, and in the "poorer" swamps dominate their respective strata. The bryophytes may include more minerotrophic *Sphagnum* mosses, as well as additional genera of mosses that do not usually occur in the acid bog forests. Stands that receive groundwater seepage may support plants such as skunk-cabbage, marsh-marigold, cinnamon fern, and royal fern. Seepage swamps have been treated as distinct communities, or as recognizable subtypes, in some nearby states and provinces (e.g., Minnesota and Ontario). Tamarack seepage swamps occur statewide but may be more common south of the Tension Zone (note that the Natural Heritage Inventory Program now tracks the southernmost occurrences as *southern tamarack swamp*).

See *bog relict* (Section 3.3.8.2), *northern wet-mesic forest* (Section 3.3.5.7), and *southern tamarack swamp* (Section 3.3.3.9) for additional information on similar communities.

3.3.5.6.2 Vertebrate Species of Greatest Conservation Need Associated with Northern Wet Forest

Nineteen vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with northern wet forest (Table 3-127).

Table 3-127. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with northern wet forest communities.

<i>Species Significantly Associated with Northern Wet Forest</i>
Birds
Spruce Grouse
Black-backed Woodpecker
Olive-sided Flycatcher
Boreal Chickadee
Mammals
Water Shrew
Northern Flying Squirrel
Gray Wolf
<i>Species Moderately Associated with Northern Wet Forest</i>
Birds
Veery
Golden-winged Warbler
Connecticut Warbler
Canada Warbler
Herptiles
Four-toed Salamander
Pickerel Frog
Wood Turtle
Mammals
Silver-haired Bat
Eastern Red Bat
Hoary Bat
Woodland Jumping Mouse
Moose

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-127 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both northern wet forest and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for


protection, restoration, and/or management of northern wet forest in each of the Ecological Landscapes (Tables 3-128 and 3-129).


- Using the analysis described above, a species was further selected if it had both a significant association with northern wet forest and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of northern wet forest. These species are shown in Figure 3-28.


Table 3-128. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with northern wet forest communities and their association with Ecological Landscapes that support northern wet forest.

Northern Wet Forest Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type	Birds (4)*				Mammals (3)		
	Spruce Grouse	Black-backed Woodpecker	Olive-sided Flycatcher	Boreal Chickadee	Water Shrew	Northern Flying Squirrel	Gray Wolf
MAJOR							
Central Sand Hills							
Central Sand Plains							
Forest Transition							
North Central Forest							
Northern Highland							
Northwest Lowlands							
Northwest Sands							
IMPORTANT							
Central Lake Michigan Coastal							
Northeast Sands							
Northern Lake Michigan Coastal							
Southeast Glacial Plains							
Southern Lake Michigan Coastal							
Superior Coastal Plain							
Western Coulee and Ridges							
PRESENT (MINOR)							
Western Prairie							

Color Key

 = HIGH probability the species occurs in this Ecological Landscape

 = MODERATE probability the species occurs in this Ecological Landscape

 = LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-129. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with northern wet forest communities and their association with Ecological Landscapes that support northern wet forest.

Northern Wet Forest	Birds (4)*				Herptiles (3)			Mammals (5)				
	Veery	Golden-winged Warbler	Connecticut Warbler	Canada Warbler	Four-toed Salamander	Pickerel Frog	Wood Turtle	Silver-haired Bat	Eastern Red Bat	Hoary Bat	Woodland Jumping Mouse	Moose
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type												
MAJOR												
Central Sand Hills												
Central Sand Plains												
Forest Transition												
North Central Forest												
Northern Highland												
Northwest Lowlands												
Northwest Sands												
IMPORTANT												
Central Lake Michigan Coastal												
Northeast Sands												
Northern Lake Michigan Coastal												
Southeast Glacial Plains												
Southern Lake Michigan Coastal												
Superior Coastal Plain												
Western Coulee and Ridges												
PRESENT (MINOR)												
Western Prairie												

Color Key

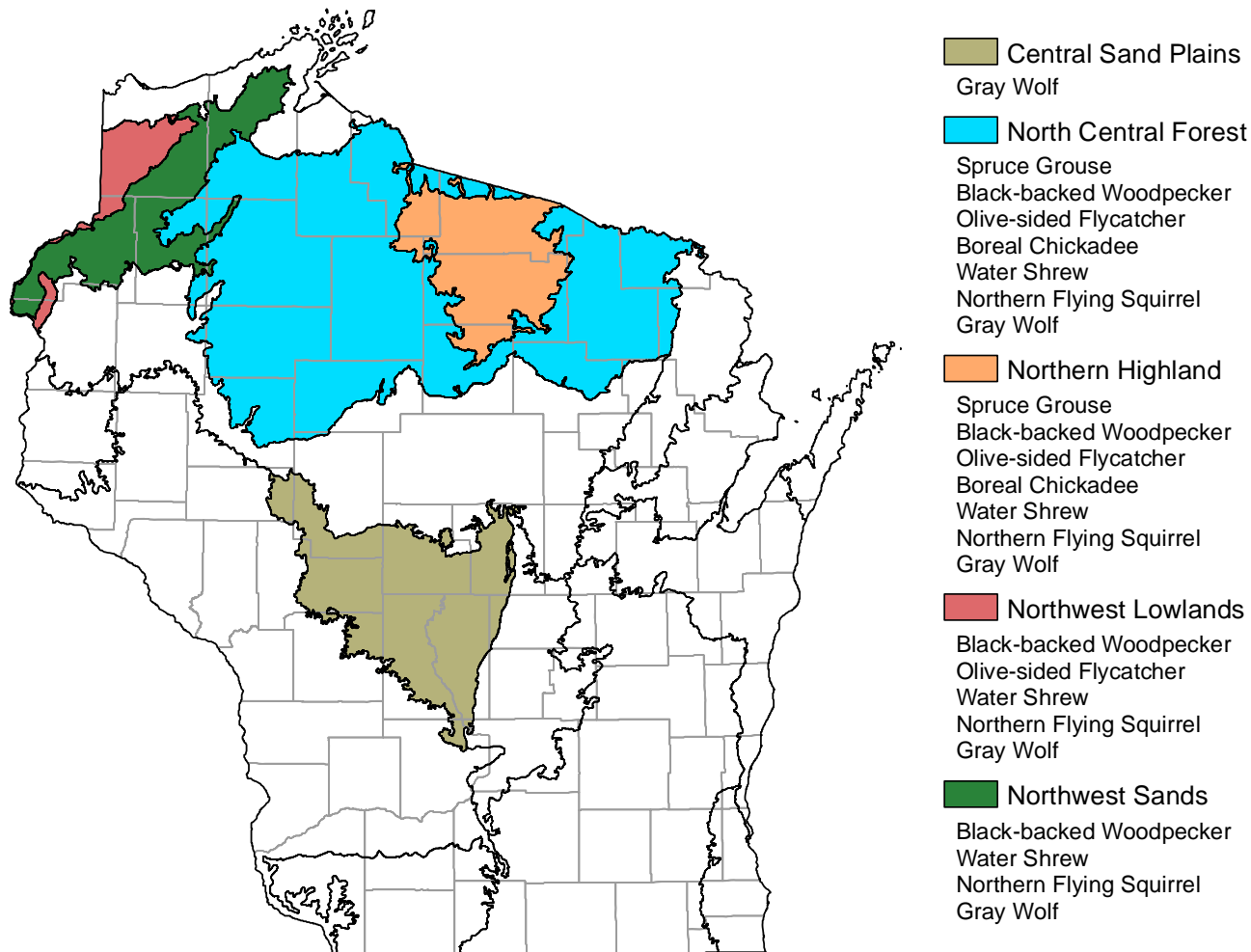
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-28. Vertebrate Species of Greatest Conservation Need that have *both* a significant association with northern wet forest *and* a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of northern wet forest.



3.3.5.6.3 Threats and Priority Conservation Actions for Northern Wet Forest

3.3.5.6.3.1 Statewide Overview of Threats and Priority Conservation Actions for Northern Wet Forest

The following list of threats and priority conservation actions has been identified for northern wet forest in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Section 3.3.5.6.3.2 unless otherwise indicated.

Threats and Issues

- Road construction, agriculture, and development can alter hydrology to the detriment of this community type. Associated impacts from sedimentation, pollutants, and pesticides can also affect the community. When hydrologic changes and other impacts occur, this community often converts to minerotrophic shrub swamp, wet meadow, or swamp hardwoods.
- Unsustainable forest management practices and agricultural uses on or adjacent to this community type can result in peat compaction, rutting, hydrologic changes, soil erosion, water quality issues, invasive species establishment, and regeneration problems. More information is needed to sustainably manage this type, and more thoroughly assess the impacts of proposed management activities. Information needs should be addressed now, as there have been several recent proposals to significantly increase utilization of conifer swamps.
- Fragmentation and isolation are local issues, but they can be significant in some Ecological Landscapes.
- Invasives (e.g., reed canary grass, marsh thistle) are a problem in some Ecological Landscapes, and should be monitored and controlled.

Priority Conservation Actions

- This type requires more survey work to identify intact, high quality sites and document the occurrences and determine the status of rare species associated with those sites.
- Basic vegetation studies are still needed for conifer swamps throughout Wisconsin, to better document composition and structure, determine the status and distributions of associated sensitive species, assess negative impacts due to hydrologic alterations and colonization by invasive plants, and develop a classification that better reflects the variability of the type. There is a need for continued monitoring and additional research to understand the composition, disturbance regimes, and hydrologic fluctuations needed to sustain this system.
- Land use planning that considers conservation needs should be implemented to limit hydrologic alterations that affect northern wet forest.
- This community type should be managed as part of a complex with other forest and wetland types where possible. Isolated sites should be embedded in other forest habitats, or buffered from land uses that can degrade them.
- Restore altered hydrology where possible.
- Opportunities to manage for boreal birds, *Lepidoptera*, and other taxa are important; additional survey work should clarify the status of some of these species and enable conservationists to better prioritize protection and management projects.
- WDNR's 'Peatlands Project' is expected to yield considerable information on this type (among other peatland communities).
- Large blocks of this habitat are needed by some habitat specialists.
- Best Management Practices and other sustainable forest management practices should be used to limit soil damage, erosion, sedimentation, and hydrologic changes.

- Continue to support research to find biocontrols for invasives. Use management practices that do not exacerbate the spread of new invasives into the community type. Monitor sites in the northern Ecological Landscapes where invasive plants are not currently a problem.

3.3.5.6.3.2 Additional Considerations for Northern Wet Forest by Ecological Landscape

Special considerations have been identified for those Ecological Landscapes where major or important opportunities for protection, restoration, and/or management of northern wet forest exist. Those considerations are described below. These are in addition to the statewide threats and priority conservation actions for northern wet forest found in Section 3.3.5.6.3.1.

Additional Considerations for Northern Wet Forest in Ecological Landscapes with **Major** Opportunities for Protection, Restoration, and/or Management of Northern Wet Forest

Central Sand Hills

Changes in hydrology due to development can be detrimental to this community type here, and there are continuing effects from past hydrologic changes (e.g., ditching, dike construction, road building). Some agricultural practices can result in soil erosion and water quality problems. Often, declining tamarack stands are not regenerating. Fragmentation and stand isolation affect this type in central Wisconsin.

Central Sand Plains

The effects of past land use (e.g., wetland drainage, dike and impoundment construction) have impacted hydrology. Some of these uses continue today where waterfowl production has been emphasized, or to meet the needs of specialized agricultural uses such as cranberry production. Fragmentation and stand isolation are issues in the eastern part of the Ecological Landscape.

Large blocks of this habitat exist, and some of them occur within extensive forests. The best opportunities for developing blocks and connecting corridors are in the central and western parts of the Ecological Landscape, in the Black River State Forest, and on the Jackson, Wood, and Clark County Forests. Where possible, block and/or buffer sites in the eastern part of the Ecological Landscape. Work to develop incentives, or other means to achieve conservation objectives, that meet the needs of cranberry growers and other large landowners of this type within the region.

Forest Transition

The best opportunities for northern wet forest occur in the eastern and extreme northern portions of the Ecological Landscape, where agricultural and residential development has been minimal. Forest fragmentation is a significant factor in many other locations here, and many wetlands are somewhat isolated by agricultural developments.

North Central Forest

This is the most important Ecological Landscape for managing northern wet forest, in terms of the types in abundance here and the forested condition of most local and regional watersheds. The Lost Lake Bog in Price County is a well preserved example within a wetland complex. Many good examples occur on the Chequamegon-Nicolet National Forests, the Flambeau River State Forest, and on county forests. More survey work is needed to identify sites that support sensitive species. Invasives are not a major problem now but should be monitored and controlled as needed.

Northern Highland

Extensive acreages of relatively unmodified acid peatlands occur on the Northern Highland-American Legion State Forest and some adjoining properties. In these areas, tamarack and black spruce are regenerating well. Opportunities to manage for boreal species (e.g., birds, *Lepidoptera*, plants) are present. Inventory assessments targeting this type have been limited to a relatively small number of the larger stands, or to those occurring within vegetation mosaics that also contain other significant features, such as old growth forests or rare species habitats. Additional survey work is needed in this type to identify those sites that contain large, intact stands; stands of especially high value to sensitive plants and animals; and sites that are critical to the protection of water quality and flood attenuation. Rare plants, birds, and invertebrates have been documented in a number of peatlands, especially those that border the water bodies that are so abundant in this landscape.

The high level of residential development in this Ecological Landscape is causing hydrologic changes, and land use planning could be an important means of limiting negative impacts. Best Management Practices and other sustainable forest management practices within and adjacent to the community should be used to limit hydrologic change.

Northwest Lowlands

The best representatives of northern wet forest are found in the Black Lake, Mud Lake-Ericson Creek, Empire and Belden Swamps in Douglas County, where they are well preserved. This Ecological Landscape has some of the lowest road densities in the state, providing habitat for species that need large remote areas relatively free of human disturbance. Large blocks of this habitat should be protected where they exist. This type should be managed as a part of a complex that includes northern mesic forest, boreal forest, and other peatland communities, such as poor fen, open bog, and muskeg. Opportunities to manage for boreal species are outstanding in the Ecological Landscape. Management should be coordinated with Minnesota to provide connectivity for wide-ranging fauna (e. g. gray wolves). Invasives are not a large problem at present in this Ecological Landscape, but should be monitored.

Northwest Sands

Acid conifer swamps of black spruce and tamarack are widespread and quite common in areas of pitted outwash where lakes and poorly drained kettle depressions are important landscape features. More comprehensive survey work is needed to identify stands of high conservation value, especially those that are large, hydrologically intact, and of importance to sensitive species. Good opportunities for protection and management exist on the Chequamegon-Nicolet National Forests.

Additional Considerations for Northern Wet Forest in Ecological Landscapes with **Important** Opportunities for Protection, Restoration, and/or Management of Northern Wet Forest

Central Lake Michigan Coastal

More detailed surveys of the Sheboygan Marsh and several similar (though smaller) wetland basins in this Ecological Landscape are needed. Much of the forest that formerly covered this region was cleared for agricultural, residential and industrial uses. Some of the conifer swamps in this Ecological Landscape should probably be classified as southern tamarack swamp.

Northeast Sands

Opportunities to manage for this type here have not been assessed thoroughly. This Ecological Landscape is known to contain sites that represent excellent opportunities to manage for the more minerotrophic “northern wet-mesic forest” type (white cedar swamp).

Northern Lake Michigan Coastal

Fragmentation from road construction and the clearing of upland forest are serious issues in this Ecological Landscape.

The best opportunities known for management of this type occur on the Door Peninsula. Further evaluation is needed to identify important community occurrences and associated rare species populations in the western and northern portions of the Ecological Landscape.

Southeast Glacial Plains

Invasive non-native plants are a problem in tamarack stands (e.g., glossy buckthorn). Poison sumac can be quite common in this community, making it difficult to work in this type here. Often, declining tamarack stands are not regenerating. Fragmentation and stand isolation are significant issues in this Ecological Landscape.

Large stands occur in Jefferson County, in the Mukwonago River watershed, and at a few other locations. Past drainage to create muck farms and pasture eliminated much of the swamp conifer community in the Ecological Landscape. Rare species include northern plants and animals at their southern range limits, but also some that are most often associated with southern “fen” habitats. Fire may have played an important role in maintaining this type historically. Some stands appear to be succeeding to hardwoods such as red maple. Restoration techniques need to be developed for this “type” (using the term broadly) in the southern part of its range.

See *bog relict* (Section 3.3.8.2) and *southern tamarack swamp* (Section 3.3.3.9) for additional information regarding these related communities that are also present in the Southeast Glacial Plains Ecological Landscape.

Southern Lake Michigan Coastal

Invasives are a significant problem in tamarack stands. Black spruce does not occur this far south and the “northern” understory is represented by a very reduced subset of plants. Often, declining stands are not regenerating. Stand isolation and fragmentation are major issues. High deer densities, fire suppression, and succession may all be affecting species composition and stand structure.

This type is extremely limited in this Ecological Landscape. Large blocks of this habitat are needed, but there are few opportunities here. Isolated sites should be embedded in other forest habitat where possible, or buffered. More survey work is needed to assess the current condition of known stands, most of which have been referred to as bog relicts in the past. Restoration techniques for this type in southern Wisconsin should be developed.

See *bog relict* (Section 3.3.8.2) and *southern tamarack swamp* (Section 3.3.3.9) for additional information regarding these related communities that are also present in the Southern Lake Michigan Coastal Ecological Landscape.

Superior Coastal Plain

Past land use practices (e.g., Cutover-era logging, intense burning) have resulted in loss and conversion (to willow and alder) of much of the type.

The vast Bibon Swamp (Bayfield County) includes stands of this type. The White River corridor between Bibon Swamp and the Kakagon Sloughs of Lake Superior warrants additional protection to alleviate sedimentation and water quality issues. Sultz Swamp, a large basin perched on the spine of the northern Bayfield Peninsula, includes good examples of acid *black spruce swamp*. Opportunities to manage for boreal species at their southern range limits are outstanding in this Ecological Landscape because of its geographic location, the presence of significant, intact occurrences, and inherent site capability. Invasive plants are not a large problem at present, but should be monitored.

Western Coulee and Ridges

The known occurrences are small and impacted by agricultural runoff (excess nutrients, sediments). Often, tamarack is declining and not regenerating. Stand isolation within cleared agricultural lands is an issue, as is the spread of invasive species.

This community type is of limited extent in this Ecological Landscape. Opportunities exist to manage for a limited suite of northern species. More detailed survey work is needed to clarify the significance of these sites for sensitive species. Tamarack sites should be blocked and/or buffered where possible.

See *southern tamarack swamp* (Section 3.3.3.9) for additional information regarding this related community that is also present in the Western Coulee and Ridges Ecological Landscape.